

Nuclear and Particle Physics Directorate Strategic Planning Retreat

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70 YEARS OF
DISCOVERY

A CENTURY OF SERVICE



Overview

- Largest effort is at the **Energy Frontier**, where BNL is the host Lab for the US ATLAS effort. There is a large research effort in the Omega group that focuses on Higgs physics, SUSY,... and a large support effort for design, construction, operation and understanding of the detector. The design and construction effort has a strong synergy with Instrumentation. The operation and analysis effort has a strong synergy with PAS and RACF and strong connections to Theory.
- A second large effort is at the **Intensity Frontier**, where BNL leads the International DUNE Project Office. There is a large research effort in the Electronic Detector Group that focuses primarily on neutrino physics (with data from Daya Bay and MicroBooNE) and a large support effort for detector design, construction, operation and analysis. The design and construction effort has a strong synergy with Instrumentation and has a strong synergy with Chemistry. There is significant overlap with PAS and a smaller synergy with RACF.
- The third effort is at the **Cosmic Frontier**, where BNL has major roles in DES and eBOSS and a leading role in construction of LSST. There is significant research effort in the Astrophysics and Cosmology Group. There is large synergy with Instrumentation on LSST and significant synergy with RACF.

Internal strengths

- World recognized strength in detector development
 - Leveraged with Instrumentation in Energy, Intensity, and Cosmic frontiers.
 - Leveraged with Chemistry for Intensity
- Excellence in Software & Computing ☐ leveraged through RACF and PAS, Largest ATLAS Tier 1 center
- Excellence in science and in scientific leadership

Internal Weaknesses

- Experiments are off site and do not retain interest of BNL management
- Ability to adapt to and implement new high priority areas is limited by tight budgets
- Cosmology needs to identify a cosmic frontier experiment for which BNL can be DOE host lab
- RACF: limited manpower with increasing number of services and requests: many single points of failure
- BNL facilities and services have become very expensive

External opportunities:

- Computing is a high priority in agency and at BNL for which we have great expertise in RACF and PAS.
 - We should tap into as many opportunities as possible.
 - CSI expertise in HPC & GPU, developments platforms on site
- Joint Appointments and/or Institutes (e.g. SBU, Yale, Columbia, NYU, Flatiron institute)
- New direct Dark Matter detection experiments based on our neutrino and CCD expertise
- Possible CAD engagement in LBNF
- Opportunities for test beams at BNL
- Cosmic experiments are generally smaller scale and cheaper

External Threats

- Uncertainty in budgets is a major threat
- LBNF/DUNE and US-ATLAS are large budget and therefore potential targets to cut. They are now tightly coupled through CERN and either would be hard to cancel.
- There are threats and opportunities for BNL as DUNE transitions from a primarily US project to an international one.
- There are threats to BNL research in both DUNE and LSST, where BNL is not the host US Lab.
- Drastic changes in the LHC Computing Model may have negative impact on BNL facilities.

Goals

- Short & medium terms
 - Continue excellence in the construction of LSST, ATLAS, ProtoDUNE/DUNE and maintain our high scientific productivity at all three frontiers.
 - Exploit scientific potential of ATLAS, LSST and DUNE. Continue and expand our leadership in distributed computing.
 - Expand our roles in DOE computing projects (ASCR)
- Long term
 - Need BNL input to build the plan past 2025-2030, when HL-LHC and DUNE construction complete
 - Become host lab for a CF experiment
 - Identify a role in future high energy and high intensity accelerators and experiments

Issues

- BNL can improve the environment to make it more attractive for collaborators to visit
 - Can we get BNL support for visitors?
 - Can we get more students to BNL (options to make it cheaper for SBU students?)
 - Housing support (very expensive to stay at BNL)
 - J1 for undergraduates (additional visa support?)
 - Users Center, cafeteria
- Improve synergies between HEP & NP for future software and computing projects
- Administrative tools are inefficient (e.g. hiring tools, PeopleSoft,...), lack of collaborative tools

BACKUP SLIDES

Computing:

- Computing is a high priority in agency. We should tap into as many opportunities as possible.
 - Software collaboration for LHC and future machines with Dubna Int'l Lab
 - Expand collaboration with Simons center
 - Andrei Nomerotski on Quantum Computing:
 - Quantum simulations (aligned with ASCR, theorists, IO)
 - Quantum networking (aligned with IO)
 - ASCR, HEPCloud, Data Management
 - Workload management (we are leading in HEP and NP). Used by ATLAS, COMPASS, bioinformatics
 - OLCF, NERSC, EU supercomputers
 - pilot projects: LSST, IceCube, ALICE, BlueBrain, nEDM, LQCD

NPP Strategic Planning Retreat Template

Viewgraph Title Page: Your Combined Groups with Contributors

Viewgraph #1: Overview/Scope of Work for the Activities

Viewgraph # 2: What are the internal strengths related to these activities (i.e expertise, reputation, equipment, facilities, etc.)

Viewgraph # 3: What are the internal weaknesses related to these activities (i.e. lack of expertise, aging facilities, etc.)

Viewgraph # 4: What are external opportunities associated with these activities (i.e. anticipated growth in area, possible collaborations, etc.)

Viewgraph #5: What are the external threats associated with these activities (i.e. lack of funding, lack of new sponsors, competition, etc.)

Viewgraph #6: Goals – both short-term and long-term and how you plan to reach them

Viewgraph # 7: Key Concerns/Issues